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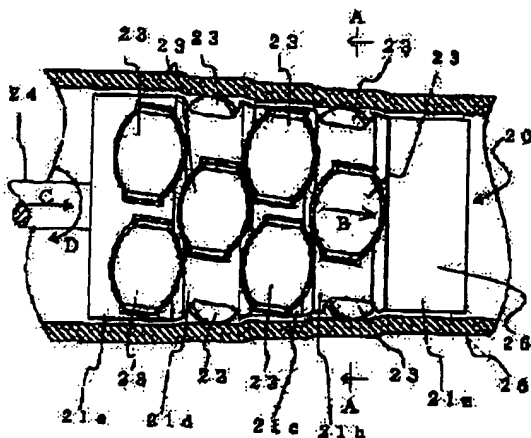
Searching by Document Number

** Result [Patent] ** Format(P801) 19.Sep.2000 1/ 1
 Application no/date: 1998-261817[1998/09/16]
 Date of request for examination: []
 Public disclosure no/date: 2000- 94068[2000/04/04]
 Examined publication no/date (old law): []
 Registration no/date: []
 Examined publication date (present law): []
 PCT application no: []
 PCT publication no/date: []
 Applicant: DAIDO STEEL CO LTD
 Inventor: TSUCHIYA MASANORI
 IPC: B21D 39/20 B21D 39/10
 Expanded classification: 125
 Fixed keyword:
 Title of invention: Tube expanding mandrel and tube expanding method of ***
 Abstract:

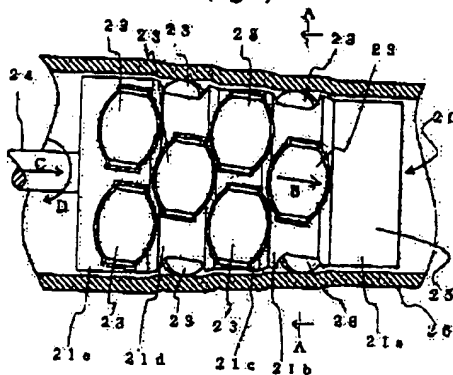
PURPOSE:*****

 Additional word:Tube expanding speed//Plunger//Waving

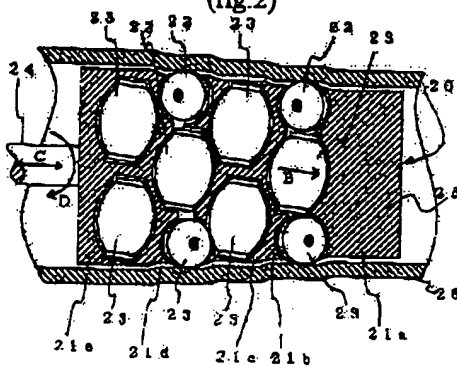
CONSTITUTION:Tube expanding mandrel 20 is inserted from the opening
 end of one side of *** 26 by a steel material. Several extending calib
 rollers 23 and 23 that are installed in the outer periphery face of
 the tube expanding mandrel body 25 turning this tube expanding mandre
 20 *(an advance)*** The internal surface of **** 26 is made to perfor
 a pressure welding.*****26*****
 (Automatic Translation)



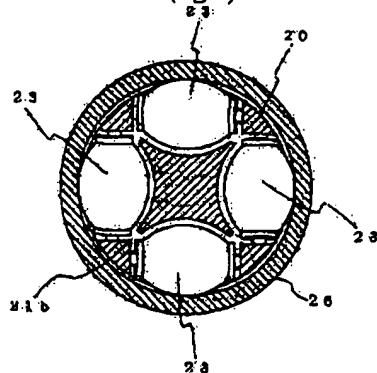
(fig.1)



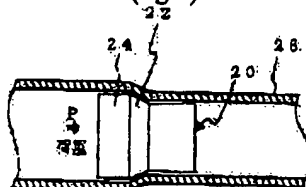
(fig.2)



(fig.3)



(fig.4)



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JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11)Publication number: 2000094068

(43)Date of publication of application: 04.04.2000

(51)Int. Cl.

B21D 39/20

B21D 39/10

(21)Application number: 10261817

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DAIDO STEEL CO LTD

(22)Date of filing: 16.09.1998

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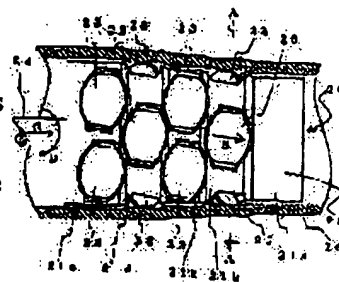
TSUCHIYA MASANORI

(54) EXPANSION MANDREL, AND METHOD FOR EXPANDING LONG TUBE USING THE MANDREL

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an expanding method of a long tube in which the friction resistance is small, the energy efficiency is high, and the dimensional accuracy is excellent in expanding the long steel tube.

SOLUTION: An expansion mandrel 20 is passed from one opening end of a long steel tube 26, a plurality of mandrel rollers 23, 23... provided on an outer circumferential surface of an expansion mandrel body 25 are pressed against an inner wall surface of the long tube 26 so as to be expanded outwardly in the radial direction while the expansion mandrel 20 is rotated in an advancing manner.



LEGAL STATUS

[Date of request for examination]
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
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CLAIMS

[Claim(s)]

- [Claim 1] The expansion mandrel characterized by arranging the diameter expansion roller which a pressure welding is carried out to the internal surface of this long spool, and can rotate in the orientation of an abbreviation tube length of the long spool in the periphery side of the expansion mandrel mainframe inserted in the long spool by steel materials.
- [Claim 2] The above-mentioned diameter expansion roller is an expansion mandrel according to claim 1 characterized by arranging more than one in the hoop direction of a mandrel mainframe at equal intervals.
- [Claim 3] The above-mentioned expansion mandrel mainframe is an expansion mandrel according to claim 1 or 2 characterized by being formed in multi-stage story so that it may become a major diameter from the point inserted in a long spool gradually towards a base edge, and forming two or more above-mentioned diameter expansion rollers in each of that **** at equal intervals at the hoop direction, respectively.
- [Claim 4] It is the expansion mandrel according to claim 1, 2, or 3 characterized by being prepared at the nose of cam of the plunger which can rotate [that ***** is free for the above-mentioned expansion mandrel mainframe, and] freely, and preparing the hand of cut of the above-mentioned diameter expansion roller with an inclination a little to the orientation of a tube length of a long spool corresponding to advance time rolling of this plunger.
- [Claim 5] The expansion technique of the long spool which pressed the internal surface of the above-mentioned long spool to the method of outside with the diameter expansion roller which inserts in an expansion mandrel and is formed in the periphery side of this expansion mandrel from one opening edge of the long spool which should be expanded.

[Translation done.]

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DETAILED DESCRIPTION[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] It is related with the expansion technique of the long spool using a suitable expansion mandrel and suitable it for this invention to expand the long spool by steel materials.

[0002]

[Description of the Prior Art] Facing expanding the long spool by steel materials conventionally, and expanding using an expansion mandrel with a taper which was shown in drawing 4, for example is performed. This inserts in the expansion mandrel with a taper 20 of illustration [edge / opening / one / of the long spool 26], and it advances the inside of the long spool 26 by stuffing this expansion mandrel 20 into the long spool 26, impressing predetermined load P, pressing and expanding the internal surface of the long spool 26 to the method of outside in the fraction of the taper section 22 to the major-diameter section 24 of this expansion mandrel 20.

[0003] The technique about this is already shown in some patent official reports, for example, JP, 7-148516, A is faced that a die draws out a long spool, and expansion and drawing are simultaneously performed through the core bar (mandrel) in a long spool.

[0004] Moreover, for example, in ***** the official report of No. 507610 (international public presentation number WO 93/25799), it faces expanding a petroleum digging pipe within a subterranean bore hole, and it expands, pulling up an expansion mandrel. Furthermore, the thing of the international public presentation WO official report of No. 98/00626 tends to be similarly expanded through an expansion mandrel to a petroleum digging pipe, and the thing of this official report tends to make small frictional resistance at the time of expansion by *****ing a ceramics to the periphery side of an expansion mandrel.

[0005]

[Problem(s) to be Solved by the Invention] However, according to the expansion mandrel (the thing with a taper is included) generally known such conventionally, since all tend to press the internal surface of a long spool according to the load added to the mandrel and tend to expand the diameter, the frictional resistance force between the internal surface of a long spool and a mandrel is large, and a mandrel does not move smoothly, but there is a problem that manipulation speed is slow.

[0006] Moreover, frictional heat occurs by the frictional resistance force of a long spool and a mandrel being large in this way, the load impressed to a mandrel is not fully transmitted as expansion force of a long spool, but the problem are bad also has energy efficiency. Furthermore, in order to repeat an intermittent forward motion and to move discontinuously with such frictional resistance, without a mandrel moving smoothly, it was what is anxious about the problem that the outer diameter of the expanded long spool is not fixed, a front face causes a **** phenomenon or manipulation asymmetry arises in a long spool with frictional resistance.

[0007] The technical problem which is going to solve this invention is faced expanding long spools, such as steel materials, can gather the expansion speed, moreover, makes frictional resistance of a long spool and a mandrel small, raises the energy efficiency by manipulation, and is to offer the expansion technique of the expansion mandrel which flapping on the front face of expansion etc. does not have in respect of a quality further, and the long spool using it.

[0008]

[Means for Solving the Problem] In order to solve this technical problem, the expansion mandrel of this invention makes it a summary to arrange the diameter expansion roller which a pressure welding is carried out to the internal surface of this long spool, and can rotate in the orientation of an abbreviation tube length of the long spool in the periphery side of the expansion mandrel mainframe inserted in the long spool by steel materials.

[0009] According to the expansion mandrel of this invention which has the above-mentioned

configuration, where a pressure welding is carried out to the internal surface of the long spool, while the diameter expansion roller which inserts in the long spool by steel materials, and is formed in the periphery side of a mandrel mainframe a towage or by pushing in rotates in the orientation of an abbreviation tube length, it moves forward. Therefore, it is extensible to radial, and the internal surface of a long spool deforms plastically and is expanded.

[0010] Since it is expanded while the above-mentioned diameter expansion roller rotates the internal surface of the above-mentioned long spool in that case, the frictional resistance between the internal surface of a long spool and an expansion mandrel is very the parvus. Therefore, since an expansion mandrel can move smoothly by low move resistance in the inside of a long spool, manipulation speed can be gathered, and the attraction required for insertion or the forward force of an expansion mandrel is small, and it comes to end, and energy efficiency will be raised, without also producing generation of heat of frictional heat etc. Moreover, the flapping phenomenon of the long spool front face produced when a mandrel does not move smoothly with frictional resistance can also be lost, and a process tolerance can be raised.

[0011] In this case, if the above-mentioned diameter expansion roller is arranged in the hoop direction of a mandrel mainframe at two or more regular intervals, since the diameter of the internal surface of a long spool will be expanded by the expansion force distributed equally [a hoop direction], the roundness of the cross-section configuration of the long spool whose diameter was expanded can expand the diameter with increase and a sufficient dimensional accuracy.

[0012] In this case, as for the above-mentioned expansion mandrel mainframe, it is good to be formed in multi-stage story so that it may become a major diameter from the point inserted in a long spool gradually towards a base edge, and to form two or more above-mentioned diameter expansion rollers in each of that **** at equal intervals at a hoop direction, respectively. Then, diameter expansion of a long spool will divide into a multi-stage story, and will be performed gradually, the frictional resistance in each phase decreases that much, the load of a diameter expansion roller is also mitigated, and manipulation speed can be gathered.

[0013] And it is prepared at the nose of cam of the plunger which can rotate [that ***** is free for the above-mentioned expansion mandrel mainframe, and] freely further, and, as for the hand of cut of the above-mentioned diameter expansion roller, it is good to be made to be prepared with an inclination a little to the orientation of a tube length of a long spool corresponding to advance time rolling of this plunger. Then, while an expansion mandrel moves forward the inside of a long spool by advance and rotation of a plunger, it will rotate also to a hoop direction, and the pressure welding of the diameter expansion roller will be equally carried out to the internal surface of a long spool by it, and the long spool with high roundness will be obtained. Moreover, since an advance move is carried out while an expansion mandrel rotates the inside of a long spool, a move in the advance orientation will be performed smoothly, and expansion will be performed quickly.

[0014] And the expansion technique of the long spool concerning this invention inserts in an expansion mandrel from one opening edge of the long spool which should be expanded, and let it be a summary to have pressed the internal surface of the above-mentioned long spool to the method of outside with the diameter expansion roller formed in the periphery side of this expansion mandrel.

[0015] Also in this case, two or more diameter expansion rollers are arranged in the hoop direction of a mandrel mainframe at equal intervals like the publication to the claim 2 or 3. Or it is formed in multi-stage story so that an expansion mandrel mainframe may serve as a major diameter from the point inserted in a long spool gradually towards a base edge. Two or more above-mentioned diameter expansion rollers are formed in each of that **** at equal intervals at the hoop direction, respectively. Furthermore, if it is prepared at the nose of cam of the plunger which an expansion mandrel mainframe can rotate [that ***** is free and] freely like the publication to a claim 4 and the hand of cut of a diameter expansion roller is prepared a little with the inclination to the orientation of a tube length of a long spool corresponding to advance time rolling of this plunger It is as having mentioned above to become that in which an expansion manipulation is smoothly performed with sufficient energy efficiency, and the manipulation dimensional accuracy was excellent.

[0016]

[Embodiments of the Invention] The gestalt of suitable implementation of this invention is explained in detail with reference to a drawing below. Drawing 1 shows the external view of the status that it inserted in the long spool which has the diameter of the expansion mandrel concerning the gestalt of 1 implementation of this invention expanded. About the long spool, it is sectional drawing. This expansion mandrel 20 is formed at the nose of cam of the plunger 24 of the oil hydraulic cylinder not to illustrate in one, and the mandrel mainframe 25 is covered over a

part for ***** of a plunger from a part for the point inserted in the long spool 26, and enlarges the path gradually in multi-stage story from 1st **** 21a to 5th **** 21e. And it has become taper-like between each **** 21a-21e.

[0017] A pressure welding is carried out to each **** 21a-21e of the above-mentioned mandrel mainframe 25 at the internal surface of the long spool 26, respectively, and the diameter expansion roller 23 which can rotate in the orientation of an abbreviation tube length of the long spool 26 is formed at equal intervals in the plurality [every] (this example every four pieces) hoop direction by ***** of the above-mentioned plunger 24. In addition, in the inside of the long spool 26, the above-mentioned plunger 24 is constituted so that ***** and time rolling may be performed so that it may be illustrated.

[0018] Drawing 2 shows sectional drawing of the orientation of a tube length of the expansion mandrel shown in drawing 1. The above-mentioned diameter expansion roller 23 is arranged at a time in one diameter expansion roller attachment hole established in the position which divides each periphery of 5th **** 21e equally from 2nd **** 21b to four. The hand of cut receives in the orientation of a tube length of a long spool. While it is prepared in the orientation to which it inclined a little, advance (the orientation of **** C) of the above-mentioned plunger 24 and the spiral hand of cut (the orientation of **** B) of the mandrel mainframe 25 by rotational (the orientation of **** D) combination are made into an opposite direction (the orientation of **** B is an opposite direction) and the pressure welding of the diameter expansion roller 23 is carried out to an internal surface. It is constituted so that it may move forward.

[0019] And like illustration, at the angle, the arrangement position of four diameter expansion rollers established in the arrangement position of four diameter expansion rollers 23 established in 2nd **** 21b and 21d of the 4th ****, respectively, 3rd **** 21c, and 5th **** 21e, respectively shifts to a circumferential direction 45 degrees, and is alternately established in it. And the pressure welding of each diameter expansion roller 23 is carried out to the internal surface of the long spool 26, and it is constituted so that it may move forward, rotating in the orientation of arrow head B which has an inclination a little to the orientation of a tube length of a long spool carrying out the press extension of the internal surface to the method of the outside of radial, and making it deform plastically to it.

[0020] Drawing 3 shows sectional drawing of the orientation (the **** orientation) which intersects perpendicularly in the orientation of a tube length of the expansion mandrel shown in the above-mentioned view 1. Four diameter expansion rollers 23 are arranged at equal intervals in the circumferential direction by **** 21b of the mainframe 25 of this expansion mandrel 20. While the expansion mandrel mainframe 25 rotates smoothly corresponding to ***** of the above-mentioned plunger 24, and time rolling, each diameter expansion roller 23 is arranged so that the orientation where a pressure welding is carried out to the inscribed side of the long spool 26, and the diameter expansion roller 23 runs may turn into the orientation to which it inclined to the orientation of a tube length, respectively so that a forward motion can be performed.

[0021] For example, the diameter expansion roller 23 arranged up in drawing 3 is formed so that the attachment position of ***** of the rotation axis may become this side from the attachment position of a left edge toward a drawing. Similarly, it is prepared so that the attachment position of the edge in the direction of the right-handed rotation of each rotation axis may become this side from the attachment position of the edge in the direction of counterclockwise about other diameter expansion rollers 23.

[0022] However, it faces expanding the long spool 26 by steel materials using the expansion mandrel 20 constituted like a lever. By making it move forward, rotating a plunger 24 with the oil hydraulic cylinder which inserts in from one opening edge in the long spool 26, and does not illustrate this expansion mandrel 20 as shown in the drawing 1 and the drawing 2. The pressure welding of the four diameter expansion rollers 23 formed in 2nd **** 21b of this expansion mandrel 20 as the 1st phase is carried out to the internal surface of the long spool 26. The tube wall of the long spool 26 of a fraction with which the pressure welding of each of that diameter expansion roller 23 is carried out in connection with rotation of each of that diameter expansion roller 23 can extend to the method of the outside of the orientation of the path.

[0023] The pressure welding of the four diameter expansion rollers 23 formed in 3rd **** 21c of this expansion mandrel 20 is carried out to the internal surface by which the diameter of the following **** and its long spool 26 was expanded, and the tube wall of the fraction can extend to the method of the outside of the orientation of the path. Furthermore, the pressure welding of the four diameter expansion rollers 23 formed in the 21d of the 4th **** of this expansion mandrel 20 is carried out to the internal surface by which the diameter of the long spool 26 was expanded, and the tube wall of the fraction can extend to the method of the outside of the orientation of the path.

[0024] As a culmination, the pressure welding of the four diameter expansion rollers 23 formed in 5th **** 21e of this expansion mandrel 20 is carried out to the internal surface by which the diameter of the long spool 26 was expanded, and the tube wall of the fraction can extend to the method of the outside of the orientation of the path. In this way, if the expansion mandrel 20 of the gestalt of this operation is made to insert in the long whole spool 26, the long spool 26 of a circular cross section with which the diameter of the whole was expanded will be obtained, and the bore will become almost equal to the path of the circle circumscribed to four diameter expansion rollers formed in 5th **** 21e.

[0025] and -- such -- the 2- of the expansion mandrel 20 -- the diameter expansion rollers 23 and 23 formed in each 5th **** 21b-21e, respectively -- the long spool 26 expands gradually over a multi-stage story by ... -- having -- the meantime -- the diameter expansion rollers 23 and 23 -- since it is what moves forward while ... rotates the internal surface of the long spool 26 -- the internal surface of the long spool 26, and the diameter expansion rollers 23 and 23 -- there is little frictional resistance between ... and a smooth expansion manipulation

[0026] moreover, there is little the frictional resistance -- the internal surface of the long spool 26, or the mandrel mainframe 25 of the expansion mandrel 20, and the diameter expansion rollers 23 and 23 -- since most occurrence of ***** cannot be found in ..., the energy loss accompanied by an expansion manipulation is not produced, either, but the load of the oil hydraulic cylinder which advances this expansion mandrel 20 that much will also be small, and will end

[0027] Furthermore, since ***** of an expansion mandrel is smoothly performed within the long spool 26, what the flapping phenomenon on the front face of a spool at the time of expansion did not happen, either, and was excellent in the path dimensional accuracy will be obtained.

[0028] The various alterations in the domain which is not limited to the above mentioned gestalt of operation at all, and does not deviate from the meaning of this invention are possible for this invention. For example, although the gestalt of the above-mentioned implementation showed the configuration which stuffs an expansion mandrel into a long spool by ***** of a plunger, and expands the diameter of it, it can also consider as a configuration which an expansion mandrel is led by ***** and expands. Moreover, the number of the diameter expansion rollers arranged in each ***** of a mandrel mainframe is not restricted, either, and it cannot so be overemphasized [four pieces] at a time by that the cross-section configuration of the long spool expanded using it becomes a true circle more closely that it is also possible three pieces or to arrange five or more pieces and it has much number of the diameter expansion roller arranged in each **** of an expansion mandrel.

[0029] moreover -- although the diameter expansion roller was arranged in **** of each phase with the gestalt of the above-mentioned implementation at the single tier -- two or more trains -- and if the arrangement position of each train is shifted mutually and arranged, more diameter expansion rollers can be arranged in the periphery of an expansion mandrel at equal intervals, and the roundness of the long spool cross section after a manipulation can be raised by using the expansion mandrel. On the other hand, you may constitute the whole mandrel mainframe 25 configuration in a taper configuration to which the path turns to ***** from a point, and turns into a major diameter from a minor diameter gradually.

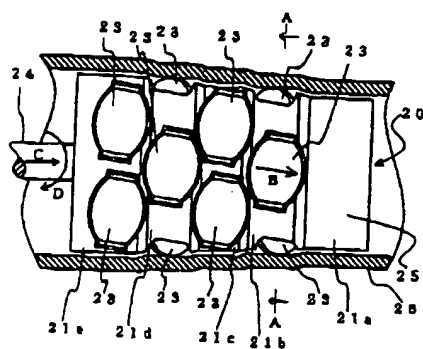
[0030] [Effect of the Invention] According to the expansion mandrel of this invention, and the expansion technique using this, since it faces expanding the long spool by steel materials, the internal surface of a long spool is pressed in the orientation of outside with the diameter expansion roller formed in the periphery side of an expansion mandrel mainframe and the inside of a long spool is advanced by rotation of the diameter expansion roller, frictional resistance at the time of expansion is lessened, and since occurrence of frictional heat can be decreased, enhancement in the energy efficiency of a manipulation can be aimed at. Moreover, it is very effective for occurrence prevention of flapping on the front face of a spool etc. and enhancement in manipulation speed to be achieved since an expansion mandrel can move smoothly in the inside of a long spool, and to apply to the pipe expanding of a petroleum digging pipe etc.

[0031] In addition, like invention according to claim 2, if two or more diameter expansion rollers are arranged in the hoop direction of a mandrel mainframe at equal intervals. The roundness of the cross-section configuration of the long spool whose diameter was expanded can expand the diameter with increase and a sufficient dimensional accuracy. like invention according to claim 3 It is formed in multi-stage story so that an expansion mandrel mainframe may serve as a major diameter from the point inserted in a long spool gradually towards a base edge. The load of the diameter expansion roller of each phase is mitigated, and manipulation speed can be raised in that by which two or more above-mentioned diameter expansion rollers were formed at equal intervals in each of that **** at the hoop direction, respectively.

[0032] Furthermore, it is prepared at the nose of cam of the plunger which an expansion mandrel mainframe can rotate [that ***** is free and] freely like invention according to claim 4. The hand of cut of the above-mentioned diameter expansion roller is prepared a little with an inclination to the orientation of a tube length of a long spool corresponding to advance time rolling of this plunger. ***** , When it is made to move forward, making the hoop direction in a long spool rotate an expansion mandrel, while a diameter expansion roller hits the internal surface of a long spool equally and the long spool with high roundness is obtained, a move in the advance orientation is performed smoothly, and it has the advantage which can expand quickly.

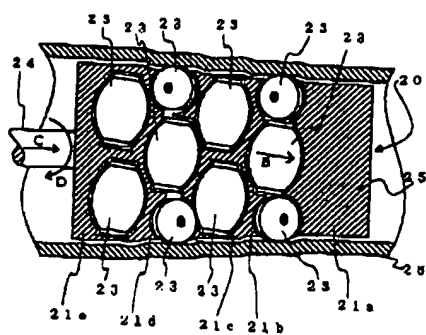
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Drawing selection Drawing 1



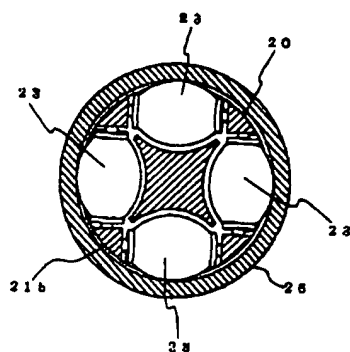
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Drawing selection Drawing 2



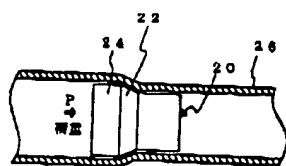
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Drawing selection Drawing 3



[Translation done.]

Drawing selection Drawing 4



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